MANAGING FOR RESULTS: HOW HIGHER MUNICIPAL CREDIT RATINGS INCREASE DATA DRIVEN MANAGEMENT IN CITIES

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1. Abstract

Data driven management is a powerful tool to help cities better address the needs of their residents. The current study examines the relationship between cities use of data as a management tool and municipal credit ratings, which research shows have important implications for the services that governments are able to deliver for their residents. While there has been extensive study of the fiscal aspects related to cities' bond ratings, there has been little investigation of the relationship between municipal managerial factors and credit ratings. The current analysis takes a completely new approach by examining cities' credit ratings and the specific approach of city management that prioritizes data to inform policy and operations. This analysis examines the management aspects of municipal credit by performing a linear regression on a unique dataset of city bond ratings, city fiscal information, and an independent rating of cities' use of data-informed management. It finds that cities with higher credit ratings are more likely to have a data-driven approach to management, even when controlling for the fiscal and demographic factors identified in previous research. This newly established relationship between bond ratings and the use of data as a management tool has important implications for how credit ratings influence city management, how cities invest in data as a management tool, and for future research about the management aspects of city government.

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2. Introduction

Governments issue bonds to fund the major projects and support their many budget commitments.[1] In particular, general obligation bonds are issued by government entities to support their normal operations and backed by their general tax revenue (and are distinct from special obligation bonds which are used for narrowly tailored purposes and are often backed by specific sources of revenue, such as tolls or fees). These general obligation bonds are scored by ratings companies, which provide investors with information about the likelihood that the government will repay the bonds as a "credit rating represents an outside opinion of the fiscal health of an organization, which decreases the uncertainty and decreases the information asymmetry between issuer and purchaser."[2] Ratings companies play a valuable role in providing investors with information to create a uniform system of assessing the risk associated with the issuance of bonds by a particular jurisdiction.

Bond ratings are important to municipalities because "interest costs affect the size of debt service payments, which impact government budgets in the short-term" and as such "governments have a strong incentive to obtain the lowest interest rates possible, or conversely, the highest credit ratings."[3] In fact, these ratings affect more than just a government's budget as they can have an impact on average citizens, the taxes they pay,

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[1] Willard T. Carleton and Eugene M. Lerner, "Statistical Credit Scoring Of Municipal Bonds," *Journal Of Money, Credit And Banking*, Volume 1, Number 4 (1969): 750-764. DOI: 10.2307/1991449.
[2] Robert A. Greer, "Local Government Risk Assessment: The Effect Of Government Type On Credit Rating Decisions In Texas," *Public Budgeting and Finance*, Volume 36, Issue 2 (Summer 2016): 73. Https://Doi.Org/10.1111/Pbaf.12082.
[3] Ibid 73.

and services they receive since "all other things equal, citizens in states with good management practices pay lower taxes."[4] In the state context, research has shown that governments with strong management are able to operate more efficiently and are likely to have better finances and lower chance of default.[5]

A key tool for strong government operations is results based management which focuses on program effectiveness and allows managers to use data to improve results.[6] In other words, using data as a management tool allows cities to improve their operations. What Works Cities, which is dedicated to evaluating cities' use of data to manage, notes that cities which use "data-driven governance" are "better equipped to deliver the most effective services and programs that improve quality of life for residents."[7]

The current research analyzes the effect of a city's credit rating on its use of data driven management. This paper starts, in section three below, with a review of past research about the relationship between credit ratings and government management. Then, in section four, about Data and Methods, it moves on to introduce the specific variables used to operationalize this exploration of municipal bond ratings and data driven management. Section five provides a summary of the results of the analysis and establishes that a higher municipal credit rating increases a city's use of data informed

[4] Skip Krueger and Robert W. Walker, "Management Practices And State Bond Ratings," *Public Budgeting and Finance*, Volume 30, Issue 4 (2010): 70. Https://Doi.Org/10.1111/J.1540-5850.2010.00968.X.
[5] Benedict S. Jimenez, "Management Quality And State Bond Ratings: Exploring The Links Between Public Management And Fiscal Outcomes," *International Journal of Public Administration*, Volume 34, Issue 12 (2011): 783.
[6] Ibid 787.
[7] What Works Cities, "What Works Cities Certification," accessed April 7, 2020, https://whatworkscities.bloomberg.org/certification/.

management. Finally, the Conclusion, in section six, summarizes the major findings and suggests areas for future research.

3. Literature Review

A robust research literature exists about the municipal fiscal and demographic factors that are related to general obligation bond ratings. For example, Cluff and Farnham identified 12 factors related to municipal bond ratings, including variables such as city revenue, city debt levels, population, economic base, and housing stock.[8] Capeci similarly found that economic, fiscal, financial, demographic, and government factors are related to municipal credit ratings.[9]

Palumbo and Zaporowski further highlighted the diversity of a city's economic base and income as important factors in credit ratings[10], while Hildreth and Miller suggest that the diversity of a city's economy influences its bond classification.[11] However, Simonsen, Robbins, and Helgerson show that population size is representative of a city's economic base and diversity as well as its credit rating.[12]

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[8] George Cluff and Paul Farnham, "A Problem Of Discrete Choice: Municipal Bond Ratings," *Journal of Economics and Business*, Volume 37, Number 4 (1985): 277-302. DOI: 10.1016/0148-6195(85)90023-2.

[9] John Capeci "Credit Risk, Credit Ratings, And Municipal Bond Yields: A Panel Study." *National Tax Journal*, Volume 44, Issue (1991): 41–56.

[10] George Palumbo and Mark P. Zaporowski, "Determinants Of Municipal Bond Ratings For General-Purpose Governments: An Empirical Analysis," *Public Budgeting and Finance*, Volume 32, Issue 2 (Summer 2012): 86-102. Https://Doi.Org/10.1111/J.1540-5850.2011.01009.X.

[11] W. Bartley Hildreth and Gerald J. Miller, "Debt and the Local Economy: Problems in Benchmarking Local Government Debt Affordability," *Public Budgeting and Finance* 22 (2002): 99–113.

[12] Bill Simonsen, Mark D. Robbins, and Lee Helgerson, "The Influence of Jurisdiction Size and Sale Type on Municipal Bond Interest Rates: An Empirical Analysis," *Public Administration Review* 61, no. 6 (2001): 709–717.

Past research has also established a methodology for measuring the relationship between fiscal data, city management, and municipal credit ratings. Previous studies (from Cluff and Farnham[13]; Denison, Yan, and Zhao[14]; Johnson and Kriz[15]) create a framework to quantitively study municipal credit ratings by converting them into numbers from the letter ratings issued by the ratings agencies (see the Data and Methods section below for additional details). Numerous studies, including Cluff and Farnham[16], also establish the regression analysis as a key methodology for evaluating the interaction of city management, municipal credit ratings, local demographics, and city fiscal factors.

While there has been significant methodological research and extensive study about the economic, demographic, and population factors of jurisdictions as they related to credit ratings, "the management dimension to credit risk analysis is largely neglected."[17] As Krueger and Walker note "despite the plethora of studies on bond ratings and interest costs, only a few have focused on issues related to management"[18] though there is a growing empirical consensus that "public management affects policy, organizational, and program effectiveness."[19]

[13] Cluff and Farnham, 1985.
[14] Dwight V. Denison, Wenli Yan, Zhirong (Jerry) Zhao, "Is Management Performance A Factor In Municipal Bond Credit Ratings? The Case Of Texas School Districts," *Public Budgeting and Finance*, Volume 27, Issue 4 (Winter 2007): 86-98. Https://Doi.Org/10.1111/J.1540-5850.2007.00889.X.
[15] C.L. Johnson and K.A. Kriz, "Fiscal Institutions, Credit Ratings, and Borrowing Costs," Public Budgeting and Finance*, [s. l.], v. 25, n. 1: 84–103, 2005. DOI* http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291540-5850/issues.
[16] Cluff and Farnham, 1985.
[17] Denson, Yan, and Zhao, 2007, 87.
[18] Kreuger and Walker, 2010, 52.
[19] Jimenez, 2011, 783.

Specifically, management practices focusing on results can allow governments to more efficiently spend funds based on the effectiveness of a program[20] and improve low performing programs.[21] As Jimenez notes: "Well-developed information systems, on the other hand, may increase the flow of information not only among members of government agencies, but also to the public. This increased transparency can be a powerful incentive for officials to exercise greater fiscal discipline."[22]

One reason for the limited study of management factors related to municipal credit ratings is a lack of good variables to measure the management effectiveness of governments. Krueger and Walker explain that "the assumption is that successful outcomes rely not only on good policymaking, but also on good management. Quantitatively demonstrating this connection, however, has been challenging."[23]

There have been some limited studies about the relationship between management and credit ratings at the state level. Kreuger and Walker found a relationship between state governments' management practices and their credit ratings, specifically that financial management capacity influences credit ratings.[24] The only other significant study of this relationship found a link at the state level between good management, fiscal outcomes, and state credit ratings with the conclusion that the quality of management systems

[20] D.P. Moynihan, *The Dynamics of Performance Management: Constructing Information and Reform*. (Washington, DC: Georgetown University Press, 2008).
[21] Poister, Theodore. *Measuring Performance In Public And Nonprofit Organizations* (San Francisco: Jossey-Bass, 2003).
[22] Jimenez, 2011, 787.
[23] Krueger and Walker, 2010, 47.
[24] Ibid.

influences state bond ratings.[25] However, to date there have been no such comprehensive studies of the relationship between municipal credit ratings for general obligations bonds and city management.

The closest such studies have looked at school districts, using student test scores to measure the managerial performance.[26] However, these examinations of school districts look at how student and school performance affect bond ratings, rather than the specific effects of management itself.[27]

In sum, the existing literature has examined the degree to which management influences bond ratings for state governments and school districts. However, no research has investigated this relationship at the city level or the degree to which bond ratings themselves affect government management. As such, the current study is the first to investigate whether the relationship between credit ratings and management also runs in this direction with credit ratings influencing management factors at the city level.

4. Data and Methods

4.1 Data Overview

The present analysis merges three distinct sets of data to create a comprehensive view of cities' finances, use of data as a management tool, and credit ratings. Taken together this

[25] Jimenez, 2011.
[26] Denison, Yan, and Zhao and K. Meier, and L.J. O'Toole Jr., "Managerial Strategies And Behavior In Networks: A Model With Evidence From US Public Education," *Journal Of Public Administration Research And Theory*, Volume 11, Number 3 (2001): 271–293.
[27] Jimenez, 2011.

data allows for an analysis that builds on past literature about the relationship between financial factors related to cities' bond ratings and introduces new information about the role of data driven municipal management.

4.2 What Works Cities Data

First, What Works Cities certifies cities based on the degree to which they use data as a management tool.[28] Specifically, What Works Cities "certification sets a standard of excellence through criteria that outline the people, processes, and policies that are foundational to a well-managed city." [29] Cities that apply for What Works Cities certification complete a questionnaire, submit supporting document, and then receive a certification score, ranging from zero up to a possible 45 points that reflects their use of data to manage their city.[30] Cities that receive a score greater than 50% (or more than 23 points) are certified at one of three levels.

This information on What Works Cities certification scores was provided by What Works Cities and is current as of March 2020. Cities' certification score is the dependent variable with scores ranging from 0-38 and mean score of 11. The current analysis also includes variables related to the amount of data focused technical assistance cities receive and cities participation in other data focused programs offered by Bloomberg Philanthropies (the principal funder of What Works Cities as well as other aligned initiatives to help city leaders use data to improve results).

[28] What Works Cities, "What Works Cities Certification," accessed April 7, 2020, https://whatworkscities.bloomberg.org/certification/.
[29] Ibid.
[30] Ibid.

4.3 Municipal Bond Data

Second, municipal credit ratings are issued by the three credit ratings agencies: Moody's Investors Service, Inc. (Moody's), Standard and Poors (S&P), and Fitch Ratings (Fitch). Greer identified S&P credit ratings as the most relevant for municipalities.[31] As such, this analysis focuses on S&P ratings for municipalities general obligation bonds, which are those issued by government entities to support their normal operations and backed by their general tax revenue (and are distinct special obligation bonds which are used for specific projects and often backed by specific sources of revenue, such as tolls or fees).

S&P rates municipal general obligation bonds on a scale from BBB- (lowest rating) to AAA (highest rating). This study compiled the current general obligation bond ratings from S&P (as of January 2020) for the 100 largest cities in the United States via Bloomberg L.P. This study focuses on the 100 largest cities in line with Simonsen, Robbins, and Helgerson's findings[32] that city population and budget size are representative of a cities' economic base as an important factor for analyzing credit ratings. Municipal credit rating is an independent variable and cities have a mean credit rating of AA.

[31] Robert A. Greer, "Local Government Risk Assessment: The Effect Of Government Type On Credit Rating Decisions In Texas." *Public Budgeting and Finance*, Volume 36, Issue 2 (Summer 2016): 70-90. Https://Doi.Org/10.1111/Pbaf.12082.
[32] Simonsen, Robbins, and Helgerson, 2001.

Building on the past research[33] described above, the current study converts S&P credit ratings into a numerical score as follows:

Table 1: Bond Ratings Scores

S&P Bond Municipal Rating	Municipal Bond Rating Score
AAA	13
AA+	12
AA	11
AA-	10
A+	9
A	8

S&P Bond Municipal Rating	Municipal Bond Rating Score
A-	7
BBB+	6
BBB	5
BBB-	4
BB+	3
BB	2
BB-	1

4.4 City Fiscal Data

The third dataset is a comprehensive dataset of city finances. This dataset includes important variables to account for past research which has established the relevance of fiscal indicators to municipal credit. The Lincoln Institute of Land Policy has created the seminal database for comparing financial factors across cities in the United States. Their Fiscally Standardized Cities (FiSC) data set "makes it possible to compare local government finances for 150 of the largest U.S. cities across more than 120 categories of

[33] Johnson and Kriz, 2005; Cluff and Farnham, 1985; Denison, Yan, Zhao, 2001.

revenues, expenditures, debt, and assets." [34] The current dataset uses the most current version of FiSC data, which is 2016.

As noted above, previous studies[35] have identified city financial, economic, and demographic variables as relevant for a city's bond rating. As a result, the current study includes variables related to a city's revenue, spending, overall budget, debt outstanding, debt payments, and population (for more details on the specific variables included from the FiSC please see Appendix A).

4.5 Summary of Data

Together these three datasets from What Works Cities, S&P, and the Lincoln Land Institute allow for a unique compilation of variables related to cities' use of data informed management, credit ratings, and fiscal indicators. This data builds on previous studies' findings while at the same time incorporating an additional variable to allow for a line of inquiry into cities' use of data as a management tool.

The methodological approach was to merge relevant variables into one complete dataset that incorporates S&P credit ratings, FiSC city fiscal information, and What Works Cities

[34] Lincoln Institute of Land Policy, "Fiscally Standardized Cities," accessed March 5, 2020, https://www.lincolninst.edu/research-data/data-toolkits/fiscally-standardized-cities.
[35] Anthony L. Loviscek and Frederick D. Crowley, "What Is in a Municipal Bond Rating?" *The Financial Review,* no. 25 (1990): 25–53. John Capeci, "Credit Risk, Credit Ratings, and Municipal Bond Yields: A Panel Study." *National Tax Journal,* no. 44 (1991): 41–56. W. Bartley Hildreth and Gerald J. Miller, "Debt and the Local Economy: Problems in Benchmarking Local Government Debt Affordability," *Public Budgeting and Finance,* no. 22 (2002): 99–113. Bill Simonsen, Mark D. Robbins, and Lee Helgerson, "The Influence of Jurisdiction Size and Sale Type on Municipal Bond Interest Rates: An Empirical Analysis," *Public Administration Review*, vol. 61, no. 6 (2001): 709–717.

Certification scores from What Works Cities. This yielded 72 complete observations that served as the basis for analysis. The analysis was then performed in Stata using a linear regression model as appropriate for an interval dependent variable.

5. Summary of Findings

5.1 Findings Overview

Previous studies have examined the management, fiscal, and demographic factors related to municipal credit scores. The current findings build upon past research by demonstrating a significant relationship between strong city bond ratings and data informed city management techniques. This analysis reveals a statistically significant relationship between a city's municipal credit rating and the degree to which the city uses data as a management tool.

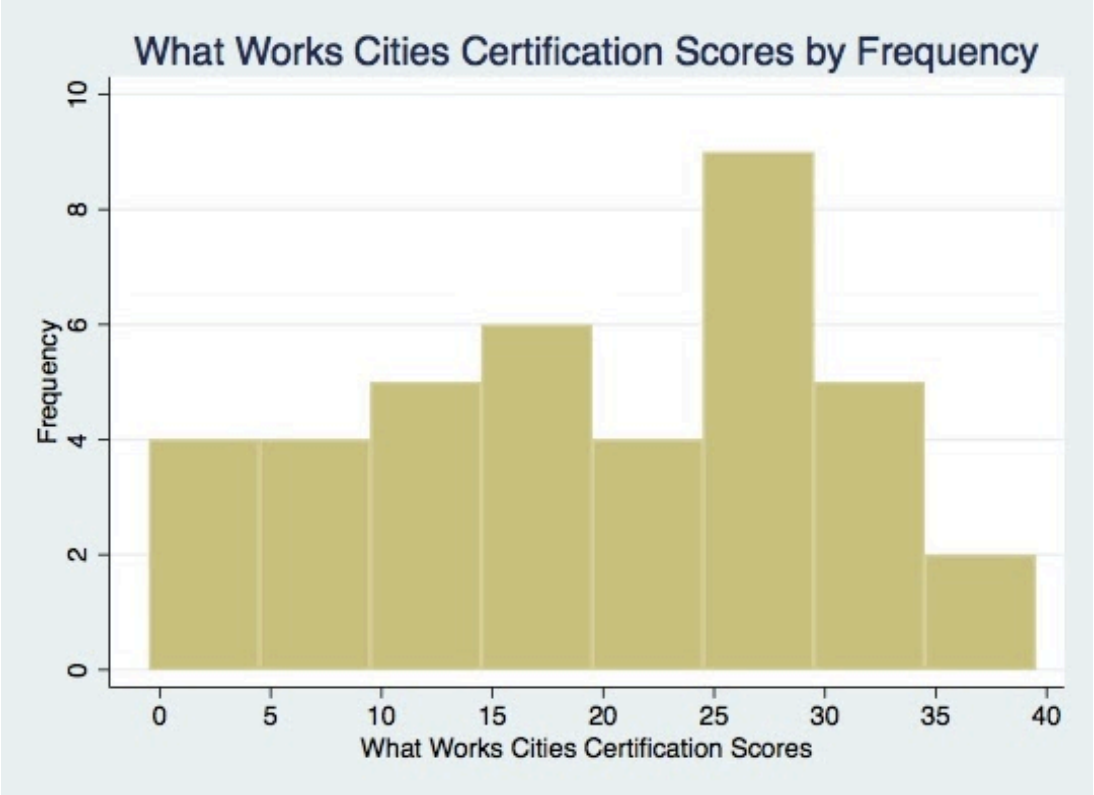
Specifically, an increase in a city's credit rating strongly increases the likelihood that the city uses data to manage its performance. This relationship adds to the existing scholarship and opens up new areas for research including an exploration of the factors that may influence this relationship between a city's fiscal standing and its use of data.

5.2 Descriptive Analysis

As noted above, combining data about the credit ratings of the 100 largest cities in the country, What Works Cities certification data, and fiscal data from the Lincoln Institute yields a dataset with complete observations for 72 cities. For these cities, the mean

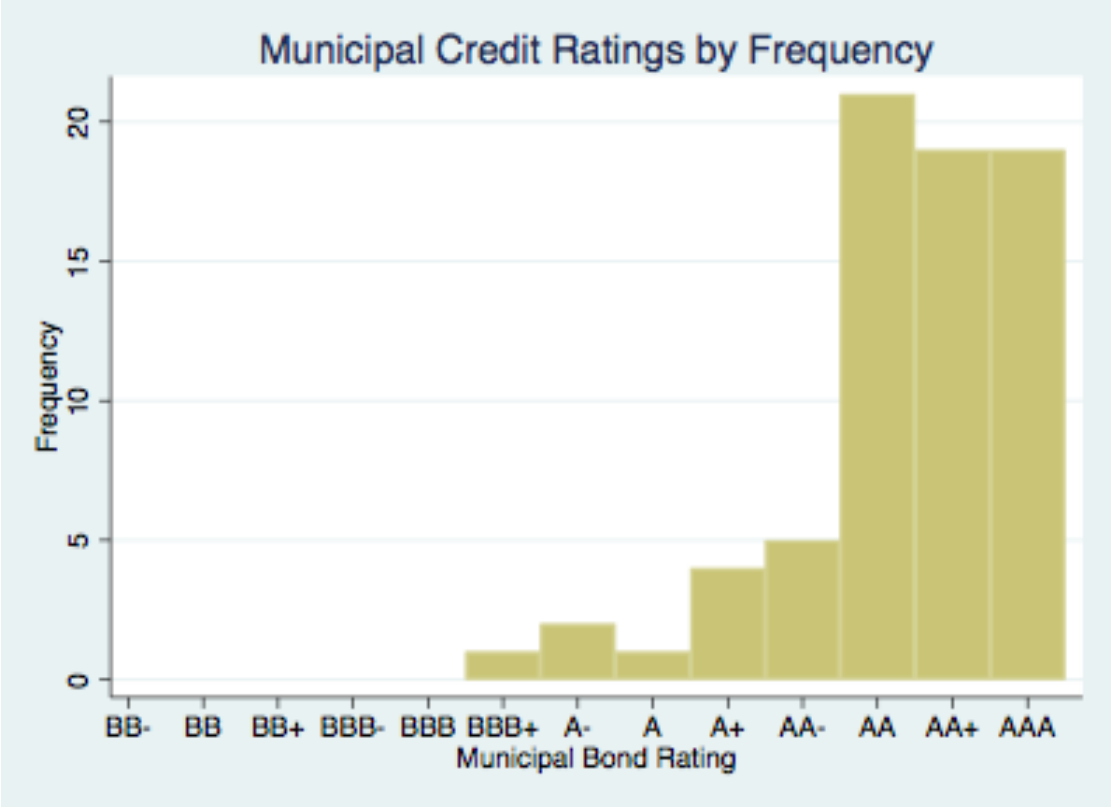
certification score is 11 (out of a possible 45). The certification scores are distributed as follows (excluding zero values to improve the readability of the graphic):

Figure 1: What Works Cities Certification Scores by Frequency



These 72 cities are mainly distributed across the AA, AA+, and AAA bond ratings. The mean S&P credit rating is AA with a standard deviation of 1.55. The S&P municipal credit ratings for cities are distributed as follows:

Figure 2: Municipal Credit Ratings by Frequency



5.3 Regression Analysis Results

An examination of the factors that are related to a municipal credit ratings reveals a number of significant findings, including a positive relationship between a city's credit rating and its certification score. The central findings of this analysis strongly support the concept that there is an important relationship between a city's fiscal health (represented by its municipal credit rating) and city's use of data as a management tool (represented by What Works Cities Certification Score).

Table 2: What Works Cities Certification Regression Coefficients

What Works Cities Certification Score	**Coef.**	**Std. Err.**	**t**	**P>|t|**
Municipal Bond Rating	1.711663	.7781791	2.20**	0.032
Number of What Works Cities Technical Assistance Engagements	11.86411	2.802667	4.23**	0.000
Participation in Additional Bloomberg City Programs	3.111787	.5906864	5.27**	0.000
City Population	.00000830	.00000415	2.00**	0.050
City Total Debt Outstanding	.00000000148	.000000000873	-1.70	0.095
City Annual Revenue	.00000000708	.00000000472	-1.50	0.139
City Long Term Debt Outstanding	.00000000555	.00000000379	1.46	0.149
City Annual Interest on Debt	.0000000169	.0000000174	-0.97	0.334
City Annual Operating Budget	.00000000391	.00000000429	0.91	0.365
City Annual Expenditures	.00000000550	.00000000453	1.22	0.229
_cons	18.87459	9.216564	-2.05	0.045

71 Observations with Probability F>0 = .000 and an adjusted R-squared of .52.
** Significant at the 95% confidence level

The main regression finding is that each 1 point increase in a city's bond rating score results in a 1.7 point increase in its What Works Cities Certification score. In other words, cities that have strong credit ratings are more likely to have strong capabilities for using data to manage as measured by What Works Cities Certification scores. This means a city with a AAA bond rating should receive a certification score almost 14 points higher than a city with a BBB rating. To put it practically, these 14 points account nearly two-thirds of the overall 23 points needed to receive What Works Cities Certification. As such, stronger municipal credit ratings can result in fairly large increases in the degree to which cities use data as a management tool.

This relationship persists when controlling for variables that previous studies[36] have identified as strongly correlated with a city's credit rating. Specifically, the fiscal and demographic variables in this model include population size, city revenue, overall city budget, and debt levels. In fact, population also has a statistically significant relationship to What Works Cities Certification score (though a small effect size). Nonetheless this is in line with previous findings that city population is positively correlated to management capacity.

Other statistically significant variables in the current analysis include the receipt of What Works Cities technical assistance and participation in other programs offered by Bloomberg Philanthropies. It makes inherent sense that receiving data focused technical assistance has a positive effect on a city's use of data driven management. Likewise, it is

[36] Ibid and Simonsen, Robbins, and Helgerson, 2001.

logical that cities which are participating in the other data focused initiatives by Bloomberg Philanthropies are more likely to use data as a management tool.

In sum, this study demonstrates that these fiscal and demographic variables not only explain variations in municipal credit scores but they are also related changes in the use of data informed management. Specifically, these municipal credit, fiscal, and demographic variables have a strong explanatory value for a city's use of data to manage with an adjusted R-squared of .52, meaning that these variables account for 52% of the variation in certification scores. In sum, sound fiscal management translates into more use of data to manage.

5.4 Significance of Findings

These findings build upon existing literature, which found that strong management systems positively affect credit ratings in state government, by introducing the idea that at the city level this relationship also flows in the other direction with strong finances leading to stronger data informed management systems.

A potential explanation is that cities in a strong fiscal position are more equipped to use data as a tool to deliver better services to their residents. As Greer notes, "interest costs affect the size of debt service payments, which impact government budgets in the short-term" with cities that have strong credit ratings paying relatively less in interest costs.[37] These lower debt payments allow for a larger proportion of the municipal budget to be

[37] Greer, 2016, 73.

invested in city operations, such as the creation of data informed management systems, since the effect of a city's bond rating "may be somewhat hidden for the average citizen, but are tangible in the form of higher taxes or lower service levels."[38]

In fact, building on the idea of debt service payments, an analysis of the ratio of total city expenditures to city interest payments reveals that cities certified by What Works Cities have relatively lower ratio of interest payments than cities with lower certification scores. Specifically, certified cities have a total budget to interest payments ratio of 19.99 while cities with scores below the certification bar have a ratio of 25.46, or more than 20% higher. In other words, cities with more data driven management have relatively lower levels of bond interest payments compared to their overall budget than cities that engage in less data driven management approaches. While this makes, since these cities tend to have better bond ratings, it also lends credence to the idea that these lower interest payments allow for more resources to be spent on creating the infrastructure to use of data as a management tool. This is in line with previous findings that governments with more resources have relatively more management capacity.[39]

These findings are similar to the resource model of political participation[40], which argues that participation in politics increases when people have sufficient time, money, education, and other resources. Applying a similar theory to municipal management

[38] Kreuger and Walker, 2010, 70.
[39] Simonsen, Robbins, and Helgerson, 2001.
[40] Brady, Henry E., Sidney Verba, and Kay Lehman Schlozman. "Beyond SES: A Resource Model of Political Participation." *American Political Science Review* 89, no. 2 (1995): 271–94. doi:10.2307/2082425.

supports the idea that a city's use of data informed management increases when it has more fiscal resources due to the lower debt service payments resulting from a stronger municipal bond rating.

If, as Kreuger and Walker summarize, "previous research provides evidence that management practices impact bond ratings…"[41] then the current analysis finds that the reverse is also true: bond ratings affect management practices, specifically data informed management. This bi-directional effect of strong management (strong management leads to better credit ratings and better ratings in turn lead to stronger management) points to the idea that strong management is a virtuous cycle. Good management leads to both higher fiscal standing and better performance management which in turn leads to increased services and improved outcomes for residents, since as Kreuger and Walker note, "if they [government services] are managed well, the long-run implications should be positive."[42]

5.5 Summary of Findings

In sum, the overall findings of this study are that cities with stronger credit ratings make larger investments in data as a management tool, allowing these governments to make decisions based on program effectiveness[43] so that mangers can deliver better results[44] for their residents.

[41] Kreuger and Walker, 2010, 53.
[42] Ibid 55.
[43] Moynihan, 2008.
[44] Jimenez, 2011, 787.

These finding have important implications for cities and credit rating agencies. Cities who want to improve their results would be well advised to improve both their fiscal strength and their use of data to make programmatic and policy decisions. For their part, ratings agencies should consider the important connection between municipal bonds and cities data informed management practices, including potentially examining the relationship between their municipal finance analysis and What Works Cities' Certification.

6. Conclusion

Municipal credit ratings and data driven management both have important implications for cities' ability to deliver effective services for their residents. While there has been extensive research about the fiscal aspects related to cities' bond ratings, there has been little research into the relationship between credit ratings and municipal management.

This study examines this relationship between municipal credit and data driven management using a linear regression on a unique dataset of city bond ratings, city fiscal information, and What Works Cities Certification scores (an independent rating of cities' use of data-informed management). The analysis builds on previous research which identified the relevance of municipal fiscal and demographic factors to municipal credit ratings.

By examining the impact of credit ratings on the degree to which cities use data as a management tool, this study adds another dimension to the study of municipal finances and management because it is the first research to establish an explicit link between a city's bond rating and its use of data as a management tool. This analysis finds that cities with higher credit ratings have a more data-driven approach to management.

The central finding is that each 1 point increase in a city's bond rating score results in a 1.7 point increase in its What Works Cities Certification score. As such, cities that have strong credit ratings are more likely to have strong infrastructure for using data to manage. This relationship persists when controlling for a city's finances and demographics (including overall city budget, debt levels, and population size), which previous studies have identified as strongly correlated with a city's credit rating. The variables in the current model have a strong explanatory value with an adjusted R-squared of .52.

This newly identified relationship between bond ratings and the use of data as a management tool is important for the field of municipal finance and management. In combination with previous studies have found that management affects municipal credit, it is now possible to conclude that there is a virtuous cycle between municipal bond ratings and municipal management: better management leads to better bond ratings which in turn leads more data driven management and cities that are "better equipped to deliver the most effective services and programs that improve quality of life for residents."[45]

[45] What Works Cities, 2020.

This finding has important implications for how credit ratings influence city management, how cities invest in data as a management tool, and for future research about the management aspects of city government. Nonetheless, the current research does have limitations because it is a snapshot of municipal credit and management at a single point in time and focuses on a relatively small set of cities. Future research could use a time series analysis approach to examine the dynamic relationship between municipal credit ratings and cities of data driven management over time. By comparing changes in bond ratings and What Works Cities Certification scores over time, future research could establish a strong causal relationship between these factors. That said, the current study is an important starting place for future exploration because it establishes a new dimension in the relationship between municipal credit and municipal management with the finding that improved bond ratings lead to improved use of data driven management by cities.

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8. Appendix A: Variables

Below is a detailed summary description of the variables included in the current analysis:

Table 3: Summary of variables of interest

Variable Name	**Variable Source**	**Variable Description**	**Current Dataset Range**
What Works Cities Certification Score	What Works Cities	City's score on What Works Cities Certification of use of data as a management tool from 0 to 45	0 to 38
Number of What Works Cities Technical Assistance Engagements	What Works Cities	Number of technical assistance engagements that a city has received from What Works Cities to improve its use of data as a management tool	0 to 3

Participation in Additional Bloomberg City Programs	What Works Cities	Number of additional Bloomberg Philanthropies programs that the city has participated in	0 to 7
Municipal Bond Rating	Standard and Poors	City's municipal credit rating converted to numerical scale of 1-13	6 to 13
City Population	Lincoln Institute of Land Policy	City's population	212,000 to 8.5 million
City Total Debt Outstanding	Lincoln Institute of Land Policy	Total dollar amount of city bonds that need to be repaid (includes long and short term debt)	$117,000,000 to $140,000,000,000
City Annual Revenue	Lincoln Institute of Land Policy	Total amount of city's annual revenue	$300,000,000 to $111,000,000,000
City Long Term Debt Outstanding	Lincoln Institute of Land Policy	Dollar amount of long term city bonds (those	$0 to $13,200,000,000

		over 12 months) that need to be repaid	
City Annual Interest on Debt	Lincoln Institute of Land Policy	Amount of interest payments a city makes on its debt each year	$2,546,601 to $5,530,000,000
City Annual Operating Budget	Lincoln Institute of Land Policy	Total budgeted spending for the city	$200,000,000 to $80,300,000,000
City Annual Expenditures	Lincoln Institute of Land Policy	Total amount of actual expenditures by the city	$267,000,000 to $113,000,000,000

The current study uses 7 key independent variables from FiSC to capture the major key factors identified in past literature. This includes measures of revenue (City Annual Revenue), budget (City Annual Operating Budget), spending (City Annual Expenditures, which is the actual amount the city spent, which could be more or less than the budgeted amount), revenue (City Annual Revenue), and debt payments (City Annual Interest on Debt). Of note, cities have two types of debt, both of which are included. Long term debt is generally used to fund long term capital projects and generally repaid over 10 to 40 years. Short term debt is bonds issued for 12 months or less to fill short term gaps. The variable of City Total Debt Outstanding includes both long and short term debt and

serves as a snapshot to capture a city's total indebtedness. Whereas the City Long Term Debt Outstanding variable provides a long term picture of a city's finances. Including both of these variables gives a complete picture of a city's fiscal health.

9. Curriculum Vita

Jed Herrmann is Vice President for State and Federal Policy Implementation at Results for America, where he leads the organization's work to help state governments and federal agencies get better results by improving their use of data and evidence. Previously, Jed was a member of the national policy staff for Hillary Clinton's presidential campaign, where he served as Director of Policy Outreach. During the Obama Administration, Jed was appointed as the Senior Advisor to the CEO at the Corporation for National and Community Service, the federal agency for national service and volunteerism. From 2004 to 2009, he worked as a senior official in the administration of Mayor Michael Bloomberg in New York City, where he was Chief of Staff and Deputy Commissioner at the New York City Department of Consumer Affairs, a consumer protection and business development agency. Jed has also served in AmeriCorps, been a New York City public school teacher, and worked with USAID in Guatemala. He is a graduate of Yale University.